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Unexpectedly high *Sphaerodactylus* diversity on a Caribbean island: new locality for the Honduran endemic *Sphaerodactylus dunni* Schmidt, 1936 (Gekkonidae: Sphaerodactylidae) on Utila Island, Honduras

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***Abstract.—Sphaerodactylus dunni* (Dunn's Least Gecko) is a rarely observed species endemic to parts of mainland Honduras. This article provides the first report of *S. dunni* on Utila Island, a location already known to host two other endemic *Sphaerodactylus*. This report from Utila extends the known range of *S. dunni* to an island locality, which represents a lowering of its elevation limit, and discusses potential introductory pathways. Detailed photographs shown here clarify the identification of this little-known species and provide basic data on morphology and scalation. We suggest that *S. dunni* be tentatively considered as an addition to the islands natural herpetofaunal assemblage, but further observations are needed to verify its establishment on Utila.**

Keywords. Central America, elevation extension, Islas de la Bahía, Least Gecko, range, Reptilia, Squamata

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Introduction

Members of the sphaerodactylid family of geckos are renowned for being some of the smallest amniotic (hard egg-laying) animals on the planet (e.g., Hedges and Thomas 2001), with a maximum size range of ca. 25–40 mm snout-vent-length (SVL) [Köhler 2003, p. 80–83]. To date, this family includes ~220 named species, distributed across the Western Hemisphere and parts of the Eastern Hemisphere, including isolated islands (McCranie 2018). Of all the gekkonid lizards, *Sphaerodactylus* Wagler 1830 is one of the most species-rich sphaerodactylid genera (Harris and Kuge 1984), with approximately 105 recognized species (McCranie 2018). Having diverged around 80 million years ago (Gamble et al. 2011), most of the diversity of this mainly Neotropical genus lies within the Caribbean (ca. 70 species, Köhler 2003). Owing to the small adult size and cryptic behavior of *Sphaerodactylus*, these diminutive lizards are elusive and easily-missed inhabitants of the ecosystems they occupy, although where they do occur, they are often found in local abundance (Köhler 2003).

Currently, ten species of *Sphaerodactylus* are known to occur in Honduras, six of which belong to the *S. millipunctatus* complex (McCranie 2018). Only recently, four new species were described from the Honduran Bay Islands; McCranie and Hedges (2012) described *S. leonardovaldesi* (Roatán) and *S. guanajae* (Guanaja), and the following year McCranie and Hedges (2013) described *S. pointdexteri* (Utila) and *S. alphus* (Guanaja). In accordance with these records, only *S. pointdexteri* and *S. rosaurae* are reported from Utila Island (McCranie and Orellano 2014); i.e., *S. pointdexteri* is endemic to Utila, whereas *S. rosaurae* is endemic to the Bay Islands of Utila, Roatán, and Cayo Cochino Menor. McCranie and Orellano (2014) reviewed the overall occurrence of herpetofaunal species on the Bay Islands and Cayos Cochinos, documenting 42 species on Utila. Since then, the most recent species addition to Utila was an invasive gecko *Leptodactylus lugubris* (Brown and Diotallevi 2019), that brought the total of herpetofaunal species on Utila to 43.

In the following account, we document the unexpected presence of a third *Sphaerodactylus* species, *Sphaerodactylus dunni* Schmidt, 1936, from a single location on Utila. This previously mainland endemic

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Fig 1. An adult *Sphaerodactylus dunni* photographed upon capture at its newly reported locality on Isla de Utila, Honduras. *Photo by Tom W. Brown.*

was only known from elevations of 60–700 m asl on the Atlantic versant of northwestern to northeastern Honduras in primary lowland moist and dry forest formations (Townsend et al. 2013; McCranie 2018). Previous reviews of its conservation status placed *S. dunni* in the lower portion of the high vulnerability category, with an Environmental Vulnerability Score (EVS) of 14 (Wilson and McCranie 2003) and 15 (Johnson et al. 2015). Wilson and McCranie (2003) reported that *S. dunni* has a stable population trend within in its restricted Honduran range, and subsequently it was listed as Least Concern by the IUCN Redlist (Townsend et al. 2013).

Materials and Methods

To document the presence of *Sphaerodactylus* on Utila, Kanahau Utila Research and Conservation Facility (URCF) has conducted opportunistic surveys across the island since 2016, with the primary aim of plotting the distributions of Utila's known endemic species (T. Brown, unpub. data). *Sphaerodactylus* are encountered by slowly shuffling amongst the leaf litter of suitable habitats and flipping suitable damp refuges such as rotting logs and coconut palms in a systematic manner; but as yet, no standardized surveys for *Sphaerodactylus* have been undertaken on Utila.

On 24 March 2019, at ca. 1430 h, a single female individual of *S. dunni* (Fig. 1) was encountered at a fringing coastal hardwood forest site en route to a locality known as Ironbound (GPS: 16°7'14.77"N, 86°53'53.23"W; 6 m asl), ca. 200 m from the northern coastline. The individual was located while slowly shuffling among leaf-litter within the forest, specifically around the base of a mature buttressed tree (Tropical Almond, *Terminalia catappa*). Upon encountering and capturing the individual, detailed photographs of key diagnostic features were taken using a Sony Cybershot DSC-HX60 (see Figs. 1 and 2A–D). The individual was then placed in a clear plastic bag to collect basic data on the morphology, i.e., snout-vent length (SVL), tail length, and weight, using electronic digital callipers and a 10 g scale. A genetic sample of the tail tip was taken using a tweezer and scissors, which was stored in a vial of 95% ethanol for future analysis. Sex was determined as female owing to the absence of a hemipenial bulge. Afterwards, the individual was released at the exact site of capture, as we did not consider it appropriate to collect a rare specimen. Geographic co-ordinates were obtained using a Garmin GPS 64sc. Photographs were analyzed using ImageJ software (Abràmoff 2004) to describe the scalation and accurately determine the lamellar counts.

Results and Discussion

This observation of *S. dunni* on Utila represents the first non-mainland or insular record of this species (Fig. 1), further raising the total number of herpetofauna recorded on Utila Island to 44 species. This new locality extends the known range for *S. dunni* by at least 32 km overseas from its closest known locality in La Cieba. Given that the highest point on Utila is 74 m asl, less than 1 km^2 of the island's habitat would fall within the prior known elevation range for this species (60–700 m asl). Hence, this record of *S. dunni* on Utila also represents the lowest reported elevation for this species in its range, at 6 m asl.

Fig 2. Key diagnostic features (outlined in white or indicated in blue) used to identify the captured individual as *Sphaerodactylus dunni* on Isla de Utila, Honduras. (**A**) Three supralabial scales positioned beneath/level to the lower anterior half of each eye; (**B**) nine narrow sub-digital lamellae on digit IV (described range of 7–11); (**C**) keeled dorsal scales (not outlined) and usually a superciliary spine located at or posterior to the level of the mid-eye; (**D**) subcaudal scales in alternating series on tail. *Photos by Tom W. Brown.*

Morphometric data are presented in Table 1.

Although *S. dunni* belongs to the cryptic yet diverse *S. millipunctatus* complex (in Honduras containing six species similar in appearance; McCranie 2018), it is more distantly related to those species in Central America (McCranie and Hedges 2013) and arguably one of the few morphologically 'unmistakeable' *Sphaerodactylus* of that group occurring in Honduras. Both males and females of this species possess a unique and relatively consistent coloration/patterning, i.e., a distinct white banding on the nape and collar, dark plain tan-brown to slate gray dorsal patterning, and red eyes. Unlike some *Sphaerodactylus*, its coloration does not appear significantly variable within its populations, although very few photographs of this species across its range are available for comparison. In addition to patterning (as characterized by McCranie 2018), *S. dunni* can be distinguished confidently from other members of its group by a combination of numerous defining morphological features, i.e., having the third supralabial ventral to the lower anterior half of each eye (outlined in Fig. 2A); 7–11 narrow subdigital lamellae on digit IV (nine counted; see Fig. 2B); possessing keeled dorsal scales (see Fig. 2C); having subcaudal scales in alternating series on tail (outlined in Fig. 2D); and usually a superciliary spine located at or posterior to the level of the mid-eye (circled in Fig. 2C). These features were all present in the captured specimen.

Despite considerable island-wide herpetological fieldwork from 2016–2020 at Kanahau URCF, as well as previous and subsequent searches at the exact encounter site, we have so far failed to locate any other individuals of *S. dunni*; and consequently, the relative abundance and the nature or timing of its colonization on Utila is debatable. Prior to this discovery on Utila, the closest reported locality for *S. dunni* on mainland Honduras is La Cieba, Departamento de Atlántida (Fig. 3).

Specifically, individuals reported from the region of La Cieba are present in Pico Bonito National Park (McCranie and Castañeda 2005). As a means of further confirmation and to provide a direct photographic comparison for this new record on Utila, Fig. 4 shows photographs of an individual encountered in a lowland

Table 1. Summary of the basic morphometric data and scale counts for the individual of *S. dunni* captured and photographed on Utila Island, Honduras.

Gender	SVL (mm)	Tail length (mm)	Weight (g)	Number of lamellae on digit IV	Supralabials to mid-eye
Female	20.2	17.8	0.75	9	3

Fig 3. Google Earth © map hosted on the IUCN platform for *Sphaerodactylus dunni* (Townsend et al. 2013), illustrating the known range of the species on mainland Honduras, modified to include the new locality on Utila Island (**X**), part of Islas de la Bahía. Map data: see Google Earth (https://www.google.com/earth/) and Townsend et al. (2013).

rainforest habitat at Pico Bonito National Park during a visit by the first author in 2014. As is apparent, this individual from the La Cieba region (Fig. 4) shares key characteristics with the individual on Utila (Figs. 1 and 2). During the Pleistocene glacial advances, Utila was probably connected with the Honduran mainland (Vinson and Brineman 1963; Wilson and Hahn 1973), and so there is the possibility that *S. dunni* has existed on Utila for the considerable time since that separation. Alternatively, the encountered individual could have been introduced more recently. Future study by Kanahau URCF aims to use genetic processing of the sampled Utila individual to compare the genetic divergence of a broadly used genetic marker with the mainland *S. dunni* population. This comparison will allow a better understanding of when *S. dunni* colonized Utila, and whether the island populations are distinct from the mainland ones on a genetic level.

Reptile introductions and dispersal mechanisms are known to include a variety of natural and increasingly anthropogenic means (Powell et al. 2011; Hegan 2014), whereby adult individuals, juveniles, or eggs might be transported inadvertently to a new locality and subsequently establish a population. Limited by their size, most *Sphaerodactylus* populations remain confined naturally to suitable habitat; typically, these tiny lizards are considered naturally incapable of long-distance travel and widespread dispersal without some form of assistance (e.g., clinging to overseas flotsam; Díaz-Lameiro et al. 2013). Notably, the small size of *Sphaerodactylus* means they can be transferred accidentally to new localities without detection by anthropogenic pathways such as agricultural trade and transport links. The closest human inhabitancy to the encounter site of *S. dunni* on Utila does include numerous cattle farms and agricultural lands, but these are ~1 km distance from that exact forest location. Although the site is located ~200 m from the northern coast of Utila, this region is unlikely to receive flotsam from the mainland range of *S. dunni*, which is located overseas in the south.

While only a single individual of *S. dunni* was discovered on Utila, we believe that the remoteness of this encounter from any major points of human introduction (e.g., Utila Town and island entry/importation/transport points), suggests the individual might not be a lone colonizer or recent introduction to the island, but that the species might be established. Considering *S. dunni* is a tiny leaf-litter dwelling gecko (maximum SVL 32 mm; Köhler 2003), it is perfectly conceivable that its presence has simply gone unnoticed until now; e.g., even the Utila endemic *S. pointdexteri* is only officially known from three female specimens from a single locality (McCranie and Hedges 2013). Nonetheless, as only a single individual of *S. dunni* was encountered, the presence of this species on Utila needs to be confirmed with reports of additional individuals to ensure this observation was not coincidental.

Evidently, island-wide research is still required to document the occurrence and cryptic diversity of *Sphaerodactylus* on Utila. Owing to the endemic and

Fig 4. Pictures of an adult *Sphaerodactylus dunni* photographed in 2014, in Pico Bonito National Park, La Cieba, Honduras, to provide direct comparison and aid in confirmation of the species' presence on Utila Island. *Photos by Tom W. Brown.*

vulnerable status of *S. dunni* in Honduras, and given its sympatric occurrence with other members of the *S. millipunctatus* group in its mainland range (McCranie 2018), we would not consider the newly recorded *S. dunni* as an invasive species or competitor to other *Sphaerodactylus* species on Utila. Instead, pending further confirmation, we propose *S. dunni* as an indigenous species and part of the island's unique herpetofaunal assemblage. The unexpected presence of *S. dunni* is yet another reason for the immediate conservation of the threatened forest ecosystems of Utila.

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Author contributions.—All authors were present in the field when the record of *S. dunni* was made. TWB identified the species and recognized *S. dunni* was previously unreported on Utila, subsequently writing and formatting the manuscript. NM, DH, and OK provided reviews and additional information throughout the publication process.

Literature Cited

Abràmoff MD, Magalhães PJ, Ram SJ. 2004. Image processing with ImageJ. *Biophotonics International* 11: 36–42.

Brown TW, Diotallevi F. 2019. A new invader for Honduras; confirmation of the Mourning Gecko, *Lepidodactylus lugubris* (Duméril and Bibron 1836) on Isla de Utila, and remarks on the island's invasive reptiles. *IRCF Amphibians and Reptiles* 26(2): 151–154.

Díaz-Lameiro AM, Oleksyk TK, Bird-Picó FJ, Martínez-Cruzado JC. 2013. Colonization of islands in the Mona Passage by endemic dwarf geckoes (genus *Sphaerodactylus*) reconstructed with mitochondrial phylogeny. *Ecology and Evolution* 3: 4,488–4,500.

Gamble T, Bauer AM, Colli GR, Greenbaum E, Jackman TRJ, Vitt LJ, Simons AM. 2011. Coming to America: multiple origins of New World geckos. *Journal of Evolutionary Biology* 24: 231–244.

Harris DM, Kuge AG. 1984. The *Sphaerodactylus* (Sauria; Gekkonidae) of Middle America. *Occasional Papers of the Museum of Zoology, University of Michigan* 704: 1–59.

Hedges SB, Thomas R. 2001. At the lower size limit in amniote vertebrates: a new diminutive lizard from the West Indies. *Caribbean Journal of Science* 37: 168–173.

Hegan AE. 2014. Alien herpetofauna pathways, invasions, current management practices, and control method ethics: a review of some significant problems in the USA. *The Herpetological Bulletin* 129: 3–14.

Johnson JD, Mata-Silva V, Wilson LD. 2015. A conservation reassessment of the Central American herpetofauna based on the EVS measure. *Amphibian & Reptile Conservation* 9(2) [General Section]: 1–94 (e100).

Köhler G. 2003. *Reptiles of Central America*. Herpeton, Offenbach, Germany. 268 p.

McCranie JR. 2018. The lizards, crocodiles, and turtles of Honduras. Systematics, distribution, and conservation. *Bulletin of the Museum of Comparative Zoology, Special Publications Series* 2: 91–134.

McCranie JR, Castañeda FE. 2005. The herpetofauna of Parque Nacional Pico Bonito, Honduras. *Phyllomedusa* 4: 3–16.

McCranie JR, Hedges SB. 2012. Two new species of geckos from Honduras and resurrection of *Sphaerodactylus continentalis* Werner from the synonymy of *Sphaerodactylus millepunctatus* Hallowell (Reptilia, Squamata, Gekkonoidea, Sphaerodactylidae). *Zootaxa* 3492: 65–76.

McCranie JR, Hedges SB. 2013. Two additional new species of *Sphaerodactylus* (Reptilia, Squamata, Gekkonoidea, Sphaerodactylidae) from the Honduran Bay Islands. *Zootaxa* 3694: 40–50.

McCranie JR, Orellana LV. 2014. New island records and updated nomenclature of amphibians and reptiles from the Islas de la Bahía, Honduras. *Herpetology Notes* 7: 41–49.

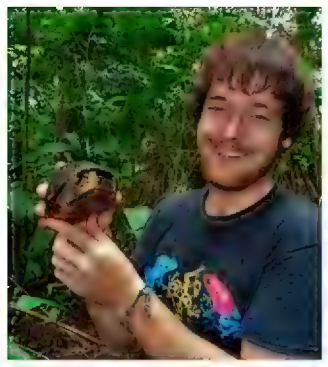
Powell R, Henderson R, Farmer MC, Breuil M, Echternacht A, Buurt G, Romagosa C, Perry G. 2011. Introduced amphibians and reptiles in the greater Caribbean: patterns and conservation implications. Pp. 63–143 In: *Conservation of Caribbean Island Herpetofaunas*. Volume I. Editors, Hailey A, Wilson BS, Horrocks JA. Brill, Leiden, Netherlands. 227 p.

Townsend JH, Wilson LD, Luque I, Mayer G. 2013. *Sphaerodactylus dunni*. *The IUCN Red List of Threatened Species* 2013: e.T178652A1540869.

Vinson GL, Brineman JH. 1963. Nuclear Central America, hub of Antillean transverse belt. Pp. 101–112 In: *Backbone of the Americas*. Memoirs of the American Association of Petroleum Geologists. Editors, Childs OE, Beebe BW. American Association of Petroleum Geologists, Tulsa, Oklahoma, USA. 320 p.

Wilson LD, Hahn DE. 1973. The herpetofauna of the Islas de la Bahia, Honduras. *Bulletin Florida State Museum, Biological Series* 17: 93–150.

Wilson LD, McCranie JR. 2003. The conservation status of the herpetofauna of Honduras. *Amphibian & Reptile Conservation* 3: 6–33 (e12).



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